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F01 Exterior Rear View Mirrors

Subject **Page**

Initial Print Date: 01/09 Revision Date:

Exterior Rear View Mirrors

Model: F01/F02

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Understand the operation of the exterior rear view mirrors on the F01/F02

Introduction

Outside Mirrors

For the F01/F02, there is only one variant of the outside mirrors. The outside mirrors can be electrically adjusted as standard. The outside mirrors are equipped with a mirror heating system.

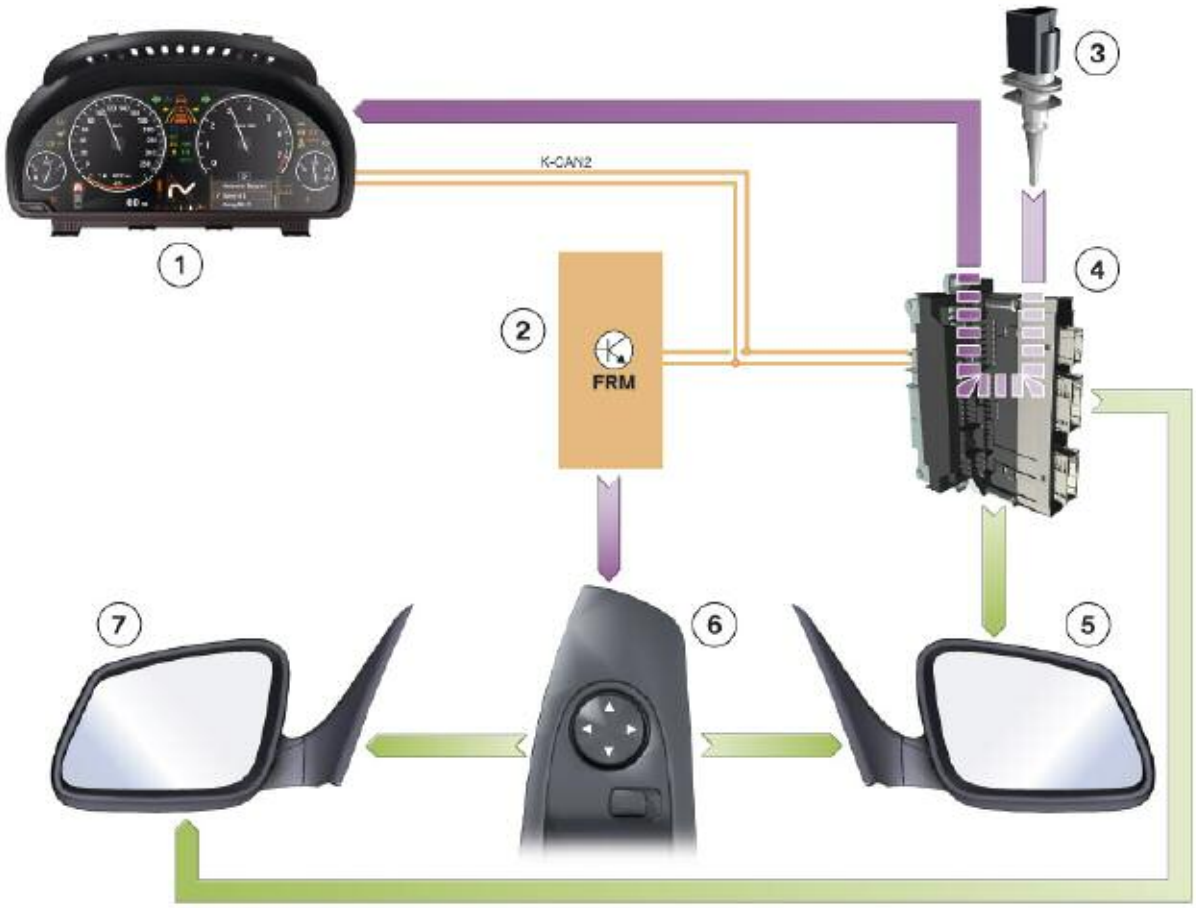
Optional Interior and exterior mirrors with automatic anti-dazzle function (electrochromic) can be ordered as an optional extra. This option requires the interior rear-view mirror with automatic anti-dazzle function.

The outside mirrors with memory function are connected via the LIN-bus and additionally feature the following functions:

- Outside mirror fold-in
- Electrochromic outside mirrors
- Electrical seat adjustment with memory

System Overview

Input/output - Outside Mmirrors



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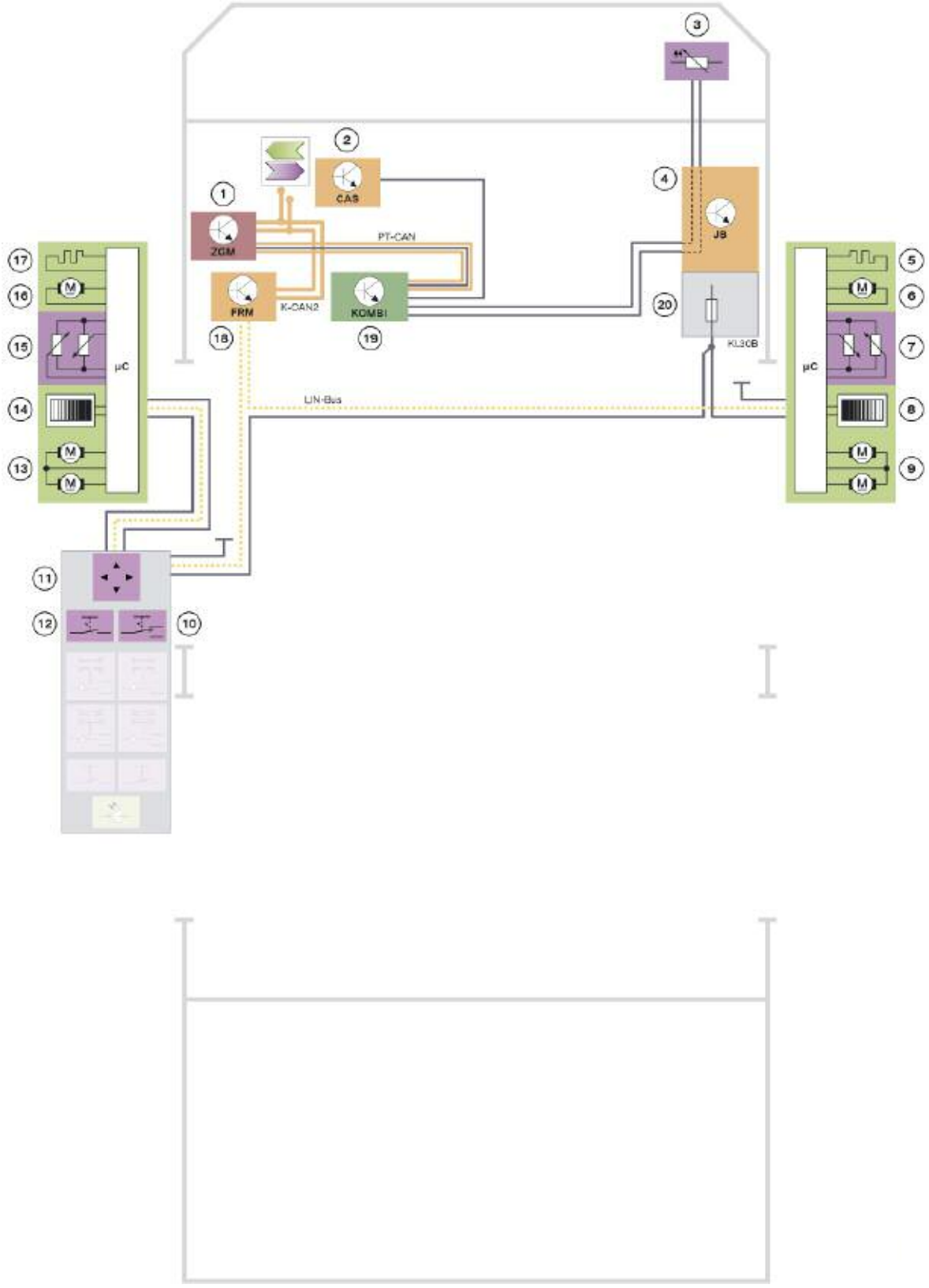
2	Footwell module FRM	6	Mirror adjustment switch in driver's door switch cluster SBFA
3	Outside temperature sensor	7	Outside mirror, driver's side
4	Junction box electronics JB	K-CAN2	Body CAN 2

Instrument cluster (1) records the outside temperature and makes this information available to the vehicle electrical system.

Junction box electronics (4) supply the outside mirror heating. The outside mirrors (5 + 6) can be adjusted with the mirror adjustment switch in the driver's door switch cluster (6).

System Circuit Diagram - Outside Mirror High



Index	Explanation	Index	Explanation
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2	Car Access System (CAS)	15	Memory, outside mirror potentiometer, driver's side
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4	Junction box electronics (JB)	17	Outside mirror heating, driver's side
5	Outside mirror heating, passenger's side	18	Footwell module (FRM)
6	Motor for folding mirror function, passenger's side	19	Instrument cluster
7	Memory, outside mirror potentiometer, passenger's side	20	Front distribution box
8	Electrochromic outside mirror, passenger's side	LIN-Bus	Local Interconnect Network bus
9	Actuator motor for passenger's side outside mirror	Kl. 30B	Terminal 30 basic operation
10	Driver's door switch cluster (SBFA) with mirror selector switch	Kl. 58g	Terminal 58g
11	Driver's door switch cluster (SBFA) with mirror adjustment switch	K-CAN2	Body CAN2
12	Driver's door switch cluster (SBFA)	PT-CAN	Powertrain CAN with mirror folding switch
13	Actuator motor for driver's outside mirror		

K-CAN2 signals at footwell module

In/out	Information	Source/sink	Function
In	Vehicle speed	Wheel speed sensor > Dynamic Stability Control	Mirror fold-in lock (inhibit)
In	Status, electrochromic interior rear-view mirror	Photodiode, rear-view mirror > roof function center	Dip outside mirror

The instrument cluster (19) receives the value corresponding to the outside temperature from the outside temperature sensor (3) and makes it available via the PT-CAN. The footwell module (18) evaluates the K-CAN2 signal and initiates activation of the outside mirror heating (5 and 17).

The mirror adjustment motors (9 and 13) are driven by the electronic mirror module. The electronic mirror module receives the request to adjust the outside mirrors via the LIN-bus.

The outside mirrors are connected via the LIN-bus. All information such as the memory-position or mirror functions, e.g. dip outside mirrors, is transferred via the LIN-bus.

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Functions

Overview

The following outside mirror functions are possible depending on the vehicle equipment:

- Mirror adjustment in up/down and left/right directions
- Mirror heating
- Mirror fold-in
- Electrochromic mirror, outside mirror with memory function
- Automatic parking function
- Manual adjustment
- Motor protection by repeat interlock

Mirror Adjustment

Outside mirror adjustment High
The driver's door switch cluster is connected via the LIN-bus to the footwell module.

The footwell module checks the status of the mirror adjustment switch every 20 ms. The electronics in the driver's door switch cluster evaluates the mirror adjustment switch and sends the signal via the LIN-bus to the footwell module. In turn, the footwell module initiates activation of the adjustment motors.

To protect the mirror drive unit, the mirror adjustment is limited to a maximum activation time of 10 seconds. Activation is maintained within this period of 10 seconds until the mirror adjustment switch is released.

Activation is also maintained until the outside mirror blocks or reaches its end position.

Detecting position of outside mirrors
The High version of the outside mirrors has two potentiometers that register the mirror adjustment. The potentiometers receive their 5V voltage supply from the electronic mirror module. The determined values of the potentiometers are stored in the footwell module for the memory function.

Mirror Heating

The mirror heating is operable as from terminal 15 ON.

Outside mirror
The mirror heating is activated by the footwell module. The corresponding information is passed on to the electronic mirror module via the LIN-bus.

The instrument cluster makes available the outside temperature value via the PT-CAN. The signal is transferred to the K-CAN2 by the central gateway module.

The junction box electronics provide the information for the wipers via the K-CAN2.

The percentage switch-on time is calculated from both values in the footwell module.

The following table shows the values for the percentage ON time:

Temperature in °C	< -10	-10 to 5	5 to 15	15 to 25	25 to 35	> 35
Heating capacity in %	100	75	50	0	0	0
Heating capacity with wipers ON in %	100	100	75	50	25	0

The percentage increase is still retained for 300 seconds after the wiper is switched off.

The maximum electric heating output is 28 W that is set by means of voltage and current measurement in the mirror.

Undervoltage

The electronic mirror module switches off the mirror heating in the event of undervoltage. This has a positive effect on the charge balance of the battery. The cutout threshold is at 10.8 V.

The electronic mirror module switches on the mirror heating again as from a voltage of 11.6 V.

Terminal 50

The “terminal 50 ON” status is output during the starting procedure. The mirror heating is switched off for the duration.

Mirror Fold-in

The mirror fold-in function is controlled by the footwell module. For this purpose, the footwell module requests the status of the mirror fold-in switch. The driver’s switch cluster evaluates the mirror fold-in switch and forwards the request via the LIN-bus. The footwell module initiates the fold-in function.

The electronic mirror module receives the request and executes this function by activating the corresponding fold-in motor. The footwell module receives the request via the LIN-bus. Both outside mirrors are folded in towards the vehicle thus reducing the vehicle width.

Electrochromic Outside Mirrors

The automatic dip function (anti-dazzle) of the outside mirrors is dependent on the setting of the interior rear-view mirror. The function is available as from “terminal 15 ON”.

The interior rear-view mirror forwards the anti-dazzle request to the junction box electronics on the LIN-bus. The junction box electronics transfer the request to the K-CAN. The footwell module is now able to receive the request.

The footwell module sends this request via the LIN-bus to the electronics in the outside mirrors. The electronics implement the request to dim the outside mirrors.

Outside Mirror with Memory Function

The outside mirror High features a memory function that is stored in the footwell module. Three memory locations are available for this purpose. They are:

- Current position when leaving the vehicle
- Memory position of memory button 1
- Memory position of memory button 2.

Identification transmitter

Up to three personalizable ID transmitters are possible per vehicle.

When the vehicle is locked using the ID transmitter, the current mirror position is stored in the memory location for the key memory of the ID transmitter currently used.

As a result, the mirror position last set, referred to the ID transmitter used, is always reassumed when the vehicle is unlocked.

Storing memory position

The position of the outside mirrors is stored in the footwell module by pressing the “M” button followed by pressing one of the memory buttons within 7 seconds.

The footwell module evaluates signals from the memory buttons on the LIN-bus and transmits this information on the K-CAN2. As a result, the seat module also knows when to store the current seat position.

Calling up memory position

When the memory button is pressed, the footwell module receives the request to adjust the outside mirrors to the memory position. The footwell module sends the request to the K-CAN2. The seat module is therefore aware of the request and instructs the seat to move to the memory position.

Automatic Parking Function
The outside mirror on the front passenger's side is swivelled downward when reverse gear is engaged so that the kerb can be easily viewed.

The automatic parking function is activated under following conditions:

- Terminal 15 ON and
- Reverse gear signal and
- Mirror selector switch set to driver position.

The footwell module receives the reverse gear signal via the K-CAN2. The automatic transmission control unit then makes this signal available.

Folding Mirror Manually
The outside mirrors can be folded in or out manually. The outside mirrors could lose their set position when folded in or out manually. It may be therefore necessary to fold out the outside mirrors, fold them in and then fold them out again.

The outside mirrors will then again be in the correct locked position.

Motor Protection by Repeat Interlock
The outside mirrors feature a repeat inhibit facility to avoid thermal overheating by frequently folding the mirrors in and out. The motors cannot be activated for 180 seconds when the repeat inhibit is active.

Mirror Auto Remote Fold-in Function (Comfort Function)
The auto remote fold-in function for the outside mirrors can be activated through following components:

- Identification transmitter
- Driver's door lock cylinder
- Outer door handle.

For example, the "Lock" button on the ID transmitter must be pressed for longer than 5 seconds to trigger the fold-in function. Fold-in is then initiated. Initially, the panoramic glass roof is closed, followed after a time delay by the front/rear windows.

With the option "Fold-in outside mirrors" The outside mirrors are folded in simultaneously with closing the rear windows.

System Components

Overview

The following components are installed in the F01/F02 for the purpose of operating the outside mirrors:

- Driver's door switch cluster with
  - Outside mirror adjustment switch
  - Outside mirror selector switch
  - LIN-bus link
- Outside mirrors
- Footwell module
- Junction box electronics
- Components for comfort/convenience function
  - Car Access System
  - Driver's door lock cylinder
  - Remote control receiver in the diversity module.

Driver's Door Switch Cluster
The driver's door switch cluster is connected via the LIN-bus to the footwell module.

The adjustment motors in the Low version of the outside mirrors are controlled directly by the mirror adjustment switch in the driver's door switch cluster.

The driver's door switch cluster in the High version of the outside mirrors is connected to the outside mirrors via the LIN-bus.

The electronic mirror module in the outside mirrors evaluates the LIN-bus signals and activates the adjustment motors.

Note: The driver's door switch cluster is connected to terminal 30B, terminal 31. The driver's door switch cluster receives the status of terminal 58g from the footwell module on the LIN-bus.

Design of the Outside Mirrors

Drive unit with memory

The drive unit with memory function additionally consists of the following components:

- Electronic mirror module
- Position potentiometer
- Folding mirror motor
- LIN-bus
- Electrochromic glass.

Note: In combination with the Active Blind Spot Detection (Lane Change Warning) the outside mirror also contains the display for the warning.

Footwell Module

The master function for controlling the outside mirrors is integrated in the footwell module.

On vehicles with memory function, the mirror position of the respective memory button (driver's seat) is stored in the footwell module.

The outside mirrors (high) and the driver's door switch cluster are connected to the footwell module via the LIN-bus. The outside mirror functions are activated via the LIN-bus.

Junction Box Electronics

The junction box electronics power the low version of the outside mirror heating system.

The signal is pulse width-modulated and has a frequency of 1 Hz.

The junction box electronics also request the status of the electrochromic interior rear-view mirror on the LIN-bus. The mirror electronics feed back the current status of the electrochromic interior rear-view mirror. The junction box electronics send the status to the footwell module on the K-CAN2. The footwell module is therefore aware of the status and is able to control the dimming of the outside mirrors accordingly.